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10/038,343	01/02/2002	Ebrahim Andideh	042390P8125D	8332

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EXAMINER
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LE, DUNG ANH

ART UNIT	PAPER NUMBER
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2818

DATE MAILED: 10/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/038,343

Applicant(s)

ANDIDEH

Examiner

DUNG A LE

Art Unit

2818

*mw*

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 13-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/2/02.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

*Dle*

DETAILED ACTION

*Oath/Declaration*

The oath/declaration filed on 1/2/2002 is acceptable.

*Information Disclosure Statement*

This office acknowledges of the following items from the Applicant:

Information Disclosure Statement (IDS) filed on 1/2/2002 and made of record .

The references cited on the PTOL 1449 form have been considered.

*Specification*

The specification is objected to for the following reason:

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed (see MPEP § 606.01).

A new abstract is required that is clearly indicative the invention to which the claims are directed. Note that, the claims are directed to semiconductor device instead of to a method of making a semiconductor device.

The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

**Claim Rejections**

**Set of claims 13- 17**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claim 13 is rejected under 35 USC 102 (e) as being anticipated by Cox et al. (6383917).**

Cox teaches (fig. 1) a semiconductor device having a dielectric layer that comprises: a first insulating layer 101, which includes a carbon doped oxide; and a second insulating layer 102, formed on the surface of the first insulating layer, that is under compressive stress and that provides superior mechanical strength, when compared to the mechanical strength of the first insulating layer (col 3, lines 5- 10).

**Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 14- 17 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Cox in view of Grill et al. (6737725).**

**Regarding claim 14,** Cox teaches the claimed invention as applied to claim 1, except for a third insulating layer, which includes a carbon doped oxide, on the surface of the second insulating layer. But Grill et al. discloses a third insulating layer, which includes a carbon doped oxide, on the surface of the second insulating layer ( column 4, line 60 to column 5, line 20 and fig. 1B ). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a third insulating layer, which includes a carbon doped oxide, on the surface of the second insulating layer, as taught by Grill et al. in order to obtain the best multilevel interconnect structure.

**Regarding claim 15,** wherein the first and third insulating layers each consist essentially of a carbon doped oxide, and the second insulating layer comprises a material

selected from the group consisting of silicon dioxide, SiOF, silicon nitride, silicon oxynitride, and silicon carbide. (Cox, col 3. line 4)

**Regarding claim 16**, wherein the carbon doped oxide included in both the first and third insulating layers includes between about 5 and about 50 atom % carbon. (Cox, col 2, line 47)

**Regarding claim 17**, the first and third insulating layers are each between about 150 and about 1,500 nanometers thick, and the second insulating layer is between about 2 and about 100 nanometers thick. (Cox, col 3, lines 5- 10)

**Set of claims 18- 20**

**Claims 18- 20 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Cox in view of the following remark.**

Cox teaches a semiconductor device having a dielectric layer that comprises: a first insulating layer 101, which includes a carbon doped oxide; a second insulating layer 102 comprising silicon dioxide, which is formed on the surface of the first insulating layer;

Cox does not teach a third insulating layer, which includes a carbon doped oxide, that is formed on the surface of the second insulating layer; and a fourth insulating layer

It would have been obvious to one having ordinary skill in the art at the time the invention was made to a third insulating layer, which includes a carbon doped oxide, that is formed on the surface of the second insulating layer; and a fourth insulating layer, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

**Regarding claim 19**, wherein the first and third insulating layers are each between about 150 and about 1,500 nanometers thick and the second and fourth insulating layers are each under compressive stress and are each between about 2 and about 100 nanometers thick. (col 2, line 63)

**Regarding claim 20.** The method of claim 19 wherein the first and third insulating layers each consist essentially of a carbon doped oxide that includes between about 5 and about 50 atom % carbon. (col2, lines 45- 50)

**Set of claims 21- 23**

**Claims 21- 23 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Cox in view of the following remark.**

Ox teaches a semiconductor device having a dielectric layer that comprises: a first insulating layer 102, which has a relatively low dielectric constant and relatively poor mechanical strength, that is between about 150 and about 1,500 nanometers

thick (col 2, lines 45- 65); a second insulating layer 102, which is formed on the surface of the first insulating layer, that has a relatively high dielectric constant and superior mechanical strength and that is between about 2 and about 100 nanometers thick (col 2, line 64 to col 3, line 15);

Cox does not teach a third insulating layer, which is formed on the surface of the second insulating layer, that has a relatively low dielectric constant and relatively poor mechanical strength and that is between about 150 and about 1,500 nanometers thick; and a fourth insulating layer, which is formed on the surface of the third insulating layer, that has a relatively high dielectric constant and superior mechanical strength and that is between about 2 and about 100 nanometers thick.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to a third insulating layer, which includes a carbon doped oxide, that is formed on the surface of the second insulating layer; and a fourth insulating layer having the same thickness of aboved-mentioned layers , since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

**Regarding claim 22**, further comprising a dual damascene interconnect, in which a via has been etched through the first, second, third and fourth insulating layers, and in which a trench has been etched through the third and fourth insulating layers. (fig. 1b)



Regarding claim 23, wherein the second and fourth insulating layers are each under compressive stress (col 2, line 64 to col 3, line 15).

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is (571) 272-1784. The examiner can normally be reached on Monday-Tuesday and Thursday 6:00am- 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

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applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DUNG A. LE  
Primary Examiner  
Art Unit 2818

